

INTISARI

Komposit hibrida dengan sambungan adhesif semakin banyak digunakan di berbagai bidang industri karena banyaknya kombinasi yang berpotensi menghasilkan material dengan keunggulan-keunggulan tertentu. Pada penelitian ini, material laminasi gabungan antara logam *Steel Plate Cold Rolled Commercial* (SPCC) dengan komposit *Carbon Fiber Reinforced Polymer* (CFRP) yang dibuat dengan perekatan adhesif diteliti untuk mempelajari karakteristik *fracture toughness* mode I dan mode II-nya. Digunakan dua jenis adhesif yaitu *epoxy* dan *cyanoacrylate*, serta dua jenis teknik perekatan yaitu perekatan sekunder dan *co-bonding* yang dibagi menjadi beberapa opsi manufaktur untuk mencari cara paling optimal dalam pembuatan laminasi hibrida SPCC/CFRP. Nilai *fracture toughness* didapatkan melalui pengujian *Double Cantilever Beam* (DCB) dan *End Notched Flexure* (ENF), masing-masing untuk mode I dan mode II. Dari hasil pengujian, disimpulkan bahwa penggunaan adhesif *epoxy* pada sambungan adhesif SPCC/CFRP menghasilkan performa *fracture toughness* yang lebih baik, terutama apabila dikombinasikan dengan teknik perekatan *co-bonding* dimana spesimen opsi manufaktur C menghasilkan nilai G_{IC} dan G_{IIC} paling tinggi, yaitu masing-masing 100.84 dan 254.94 J/m². Laminasi hibrida SPCC/CFRP mengalami mode kegagalan adhesif di permukaan SPCC untuk opsi manufaktur yang menggunakan adhesif *epoxy*, dan kegagalan adhesif di permukaan CFRP untuk opsi manufaktur dengan adhesif *cyanoacrylate*.

Kata kunci: *fracture toughness*, komposit, sambungan adhesif, laminasi hibrida SPCC/CFRP, *double cantilever beam*, *end notched flexure*.

ABSTRACT

Hybrid composites with adhesive joints are increasingly being used in various industrial fields because of the many possible combinations that have the potential to produce materials with certain advantages. In this research, the laminates combination between Steel Plate Cold Rolled Commercial (SPCC) metal and Carbon Fiber Reinforced Polymer (CFRP) composite made by adhesive bonding was investigated to study the fracture toughness characteristics of mode I and mode II. Two types of adhesives are used, namely epoxy and cyanoacrylate, as well as two types of bonding techniques, namely secondary bonding and co-bonding, which are divided into several manufacturing options to find the most optimal way to manufacture SPCC/CFRP hybrid laminates. The fracture toughness value was obtained through Double Cantilever Beam (DCB) and End Notched Flexure (ENF) testing, respectively for mode I and mode II. From the test results, it was concluded that the use of epoxy adhesive in SPCC/CFRP adhesive joints resulted in better fracture toughness performance, especially when combined with the co-bonding adhesive technique, as shown by manufacturing option C specimens that produced the highest G_{IC} and G_{IIC} values, 100.84 and 254.94 J/m² respectively. SPCC/CFRP hybrid laminates experienced adhesive failure modes on the SPCC surface for manufacturing options using epoxy adhesive, and adhesive failure on the CFRP surface for manufacturing options with cyanoacrylate adhesive.

Kata kunci: *fracture toughness, composite, adhesive joints, SPCC/CFRP hybrid laminates, double cantilever beam, end notched flexure.*